

### **REMARKS**

This Amendment and Response is filed in reply to the Office Action dated July 16, 2002. In this Response, Applicants amend claims 31, 37, and 40 to correct terminology and form issues. Amendments to the claims are not an acquiescence to any of the rejections. Furthermore, silence with regard to any of the Examiner's rejections is not an acquiescence to such rejections. Specifically, silence with regard to Examiner's rejection of a dependent claim, when such claim depends from an independent claim that Applicants consider allowable for reasons provided herein, is not an acquiescence to such rejection of the dependent claim(s), but rather a recognition by Applicants that such previously lodged rejection is moot based on Applicants' remarks and/or amendments relative to the independent claim (that Applicants consider allowable) from which the dependent claim(s) depends. Furthermore, any amendments to the claims are being made solely to expedite prosecution of the instant application. Applicants reserve the option to further prosecute the same or similar claims in the instant or a subsequent application. Upon entry of the Amendment, claims 1-10 and 31-40 are pending in the present application.

The issues of the July 16, 2002 Office Action are presented below with reference to the Office Action.

With regard to the Office Action, paragraph 1: Applicants thank the Examiner for considering the previously filed amendment.

Applicants further note that the Examiner issued an Office Action on June 7, 2002, and thereafter issued the present Office Action on July 16, 2002. The present Office Action does not revoke or rescind the June 7, 2002 Office Action, and thus Applicants respectfully request that Examiner expressly revoke such June 7, 2002 Office Action in a written correspondence.

With regard to the Office Action, paragraph 2: Examiner rejects claims 1-6, 31, 32, and 34-40 based on Guziec et al (U.S. 5,951,475) and Delorme (XP10358815) under 35 U.S.C. 103(a).

Applicants respectfully disagree with Examiner's characterization of Guziec et al. Guziec et al. teach a "method and system for registering two dimensional fluoroscopic images with a three dimensional model of a surgical tissue of interest. The method includes the steps of:

(a) *generating, from CT or MRI data, a three dimensional model of a surgical tissue of interest*" (Summary, lines 1-5. See also Col. 3, lines 59-60 and Col. 24, lines 31-37). As provided previously herein, the Guziec et al. method includes "registration of a three-dimensional CT-scan to two dimensional X-ray projection data" (Col. 2, lines 53-55). In contrast to Examiner's statement on Page 3 ("Since minimizing the distance necessitates changing the size and shape of the model, it is obvious to one having ordinary skill in the art that the transformation method as taught by Guziec involves deformation..."), Guziec et al. expressly state at Col. 7, lines 15-17: "Disclosed herein is a method for *rigid registration*, i.e., *without deformation*, of CT scan data..."

In contrast, Applicants' independent claim 1 expressly includes *deforming the 3D template model*. Applicants' claim 1, unlike Guziec et al., is not directed to a rigid registration process. Guziec et al. therefore *expressly teach away from* a method and system such as that claimed by Applicants in claim 1, that use deformation. Accordingly, Examiner's suggestion that Guziec et al. can be combined with another reference to satisfy the features of Applicants' independent claim 1 which expressly includes deformation, is inappropriate. Because Guziec et al. expressly teach away from deformation methods, a combination with Guziec et al. provides no motivation to combine under 35 U.S.C. 103(a), at a minimum, and for at least such reason, Examiner fails to provide a prima facie case of obviousness under 35 U.S.C. 103(a) with respect to Applicants' independent claim 1.

Applicants accordingly traverse Examiner's rejection of independent claim 1 based on Guziec et al. and 35 U.S.C. 103(a), regardless of the secondary reference, and Applicants consider independent claim 1 to be allowable. Because claims 2-10 depend from allowable independent claim 1, Applicants consider claims 2-10 to also be allowable as depending upon an allowable base claim.

Examiner also rejects Applicants' independent claims 31, 37, and 40 based on Guziec et al. and Delorme (XP10358815), based on 35 U.S.C. 103(a). Applicants' independent claims 31, 37, and 40 include extracting a bone contour from 2D X-rays, identifying the bone contour on a 3D template, adjusting the 3D template based on the contour, and minimizing the differences

between the adjusted bone model and the X-ray images. Independent claims 31, 37, and 40 are amended to clarify that the *adjusted* bone template and X-ray image differences are minimized.

Applicants' claimed methods and systems of independent claims 31, 37, and 40 include several distinctions from Guziec et al. First, Guziec et al. extract data from the 3D CT scans and register such data to bundles of 3D lines that pass through detected contours in the 2D X-ray (See Figure 3) by iteratively matching 3D points from the CT scan or "model" with the bundles of 3D lines. Applicants' methods and systems of independent claims 31, 37, and 40 can be viewed as the reverse, where contour data is extracted from the 2D X-rays and identified on a 3D template, where differences are minimized between the adjusted 3D template and the X-rays. Guziec et al. never discuss adjusting the Guziec et al. 3D "model", as provided in Applicants' independent claims 31, 37, and 41, where such "model" in Guziec et al., is the CT scan data.

In further contrast, Guziec's 3D "model," or CT scan data, is not the same as Applicants' *template model*. Applicants' independent claims 31, 37, and 40 discuss adjusting a *template* model. Guziec et al. do not use a *template*, but rather, use a CT scan of the patient's bone, and X-ray data of the patient's bone, and register the two sets of information. In contrast, Applicants' claimed system of independent claims 31, 37, and 40 adjusts a 3D *template* that includes a contour of the bone contour from the patient's 2D X-rays.

Because Applicants' independent claims 31, 37, and 40 include *adjusting a template*, while Guziec et al. never teach the use of a template, and as previously provided herein, Guziec et al. specifically *teach away from* any type of adjustment or deformation of such 3D template, Applicants consider Guziec et al. to be an inappropriate reference, alone or in combination with any other reference, to support a rejection under 35 U.S.C. 103(a). Accordingly, Applicants consider independent claims 31, 37, and 40 to be allowable. Because claims 32-36 and 38-39 depend from allowable independent claims 31 and 37, Applicants consider such dependent claims to also be allowable.

With regard to the Office Action, paragraph 3: Applicants thank the Examiner for the finding of allowable subject matter in claims 7-10.

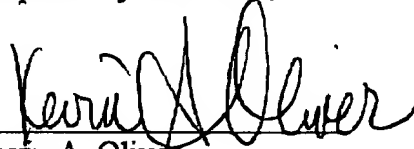
### Conclusion

Applicants consider the Response herein to be fully responsive to the Office Action dated July 16, 2002. Based on the above Remarks, it is respectfully submitted that this application is in condition for allowance. Accordingly, allowance is requested. If there are any remaining issues or the Examiner believes that a telephone conversation with Applicants' attorney would be helpful in expediting the prosecution of this application, the Examiner is invited to call the undersigned at 617-832-1241.

Respectfully submitted,

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## **MARKED-UP VERSION OF CLAIMS**

31. (once amended) A method of creating a 3D (three-dimensional) model of a bone, comprising:  
extracting a bone contour from a plurality of 2D (two-dimensional) X-ray images;  
identifying the bone contour on a 3D template bone model;  
adjusting a size and position of the template bone model based on the bone contour; and,  
minimizing the differences between the adjusted template bone model and the X-ray images.
37. (once amended) A system, comprising:  
a 3D (three-dimensional) template geometry database having stored therein at least one 3D template bone model; and,  
a 3D geometry reconstructor module;  
wherein the reconstructor module creates a 3D model of a bone by:  
extracting a bone contour from a plurality of 2D (two-dimensional) X-ray images;  
identifying the bone contour on a 3D template bone model;  
adjusting a size and position of the template bone model based on the bone contour; and,  
minimizing the differences between the adjusted template bone model and the X-ray images.
40. A 3D (three dimensional) geometry reconstructor, comprising:  
means for extracting a bone contour from a plurality of 2D (two-dimensional) X-ray images;  
means for identifying the bone contour on a 3D template bone model;  
means for adjusting a size and position of the template bone model based on the bone contour; and,  
means for minimizing the differences between the adjusted template bone model and the X-ray images.